



## **Executive Summary**

### **ES.1 Background**

The purpose of the Alternative Screening Analysis Report (ASAR) is to expand upon the Draft Alternative Screening Evaluation and Site Evaluation Report issued in 2008, present the findings of the Massachusetts Estuaries Project (MEP) modeling work, and provide a description of the eight scenarios/options run to meet the nitrogen Total Maximum Daily Loads (TMDLs). These findings are used to develop the framework and direction of the project so the Town of Mashpee can develop its Draft Recommended Plan/Draft Environmental Impact Report for TMDL compliance within the Project Planning Area (PPA) watersheds of Popponesset Bay and Waquoit Bay East. The PPA is shown in Figure ES-1.

Several reports have been issued to date including the 2007 Needs Assessment Report (NAR) and 2007 Technology Screening Analysis Report. Since the start of this project two notices of project change have been issued through MEPA. The certificates and response to comments are included in Appendix ES-1.

### **ES.2 Needs Assessment Report (April 2007) Summary**

The NAR discussed the environmental resources, existing and future development conditions, and nitrogen removal needs. In addition, various factors were identified to aid in determining priority areas for nitrogen removal and development of a management plan. The factors that were used in identification of needs assessment priority areas included:

- MEP calculations of necessary nitrogen removal for estuary health.
- Wastewater nitrogen loading per acre.
- Seasonality (seasonality was identified for towns outside of Mashpee for comparison only—the other towns may not consider this a priority when developing their town-wide management plans).
- Other Town considerations (phosphorus, previous studies, etc.).

The document then summarized the estimated wastewater flows and loads based on existing water data used as part of the MEP modeling efforts. In addition a parcel by parcel analysis of nitrogen per acre was developed to help identify concentrated areas of nitrogen loading relative to the watersheds.

### **ES.3 Technology Screening Report (November 2007) Summary**

Following the issuance of the Needs Assessment Report, the Technology Screening Report was issued. This report identified a group of alternative wastewater management technologies and management options to be considered to meet the Project Planning Area's nitrogen reduction requirements, with a primary focus on wastewater treatment and disposal technologies.

The Technology Screening Report identified specific technologies associated with:

- Decentralized technologies including:
  - Individual Innovative and Alternative (I/A) septic systems.
  - Cluster systems:
    - Those serving flows less than 10,000 gallons per day (gpd).
    - Those requiring a groundwater discharge permit (small wastewater treatment plants).



- Centralized facilities:
  - Those facilities serving large areas of Town. These facilities are often municipally run and typically treat wastewater flows greater than 150,000 gpd.

Some additional components that are associated with cluster systems and centralized facilities were evaluated in this report. Those components included:

- Collection systems.
- Disinfection technologies.
- Effluent disposal (treated water recharge).
- Water reuse technologies.

In addition other nitrogen mitigation measures were identified and reviewed.

### **ES.3.1 Technology Findings (Wastewater)**

A multitude of small individual onsite I/A technologies were evaluated in this report. Approved technologies are identified by MassDEP. However, at the time the 2007 report was prepared the following technologies were identified as favorable for nitrogen removal applications within the Project Planning Area:

- Amphidrome®
- Bioclere®
- FAST®
- Nitrex™/Omni RSF
- Norweco Singulair
- Recirculating Sand Filters (RSF)
- RUCK

To the extent they are currently being discussed on Cape Cod, Eco-Toilets were not carried forward as part of the Technology Screening Report; however there is growing interest in these types of systems. Mashpee will need to establish how Eco-Toilets may be used as part of the Recommended Plan. The Town of Falmouth is actively leading this work in demonstration projects, and the Town of Mashpee currently has regulations allowing the use of certain types of Eco-Toilets, but a robust plan of how these can be used as part of achieving TMDL compliance will likely be part of the adaptive management approach of the Recommended Plan.

Cluster/Package and centralized facilities have a large array of technologies as well. However, the focus was identifying those capable of meeting groundwater discharge permit levels of less than 10 mg/L total nitrogen (TN) and those less than 3 mg/L TN. The findings recommended that technologies such as those listed below be considered when treatment performance of less than 6 to 10 mg/L TN is required.

- Activated Sludge/Extended Aeration(AS/EA)
- Sequencing Batch Reactor (SBR)
- Membrane Biological Reactor (MBR)



- Rotating Biological Contactor (RBC )—for existing facilities only

To achieve less than 3 mg/L these technologies are typically coupled with a denitrification filter. The use of denitrification filters to achieve levels less than 3 mg/L will be considered for those facilities that would recharge within one of the watersheds (Popponeset or Waquoit Bay); however, since it is possible to add properly planned and designed denitrification processes to the end of the treatment process, these types of advanced treatment facilities may be phased in over time.

There are several different types of denitrification processes. They will be specified based on the treatment system that precedes them and client preference regarding operations, among other considerations. These can include traditional upflow and downflow filters in addition to Nitrex™ or other media based systems.

Use of RBCs will only be considered for use as they currently exist within the Town at existing wastewater treatment facilities. Any facility that has to achieve 3 mg/L in the future will need to be upgraded to one of the three previously identified technologies (AS/EA, SBR, MBR) due to the difficulty of RBC systems to consistently achieve full nitrification of their effluent. This too will be a phased approach as existing facilities reach their design capacity or design life.

Ancillary facilities for these larger systems would include:

- UV disinfection will be the only disinfection technology considered as stated in Chapter 2 and the Technology Screening Report.
- Odor Control and sludge management systems/technologies will be considered on a site-by-site and process-by-process consideration as part of the Recommended Plan development and will be evaluated in the next report phase.
- Collection systems (vacuum, gravity, STEP, STEG, and low pressure sewers) all remain in consideration and should be evaluated at the time of design when site conditions, survey, utility constraints, and design requirements are known. At this time the Town/District/Sewer Commission does not have any formal sewer guidelines or regulations that may dictate the components of the system and therefore impact the cost or feasibility of installation.
- Use of open sand beds, traditional subsurface leaching facilities, and drip irrigation are being carried forward as treated water recharge technologies. Spray irrigation is limited by its use, its infrastructure requirements, time of year use restrictions, and strict DEP regulations that regulate its use and its effluent quality and therefore is not being carried forward.

### **ES.3.2 Technology Findings (Stormwater)**

Best Management Practices (BMP's) need to be implemented on a case-by-case basis, with nutrient removal capabilities considered in most sensitive watersheds. The Town should continue the implementation of these features and focus on the use of the following technologies within the more sensitive watersheds:

- Dry extended detention basins.
- Wet retention ponds.
- Infiltration basins.



- Stormwater wetlands.
- Submerged gravel wetlands.
- Bioretention (rain gardens).
- Water quality swales.
- Infiltration trenches.

### **ES 3.3 Technology Findings (Other Nitrogen Reduction Approaches)**

The report also reviewed items such as oyster propagation, groundwater treatment, fertilizer management, landscape design practices, animal waste management, open space acquisition, and public education—all of which are potential components of what the Town will craft into an adaptable management approach. All of these non-wastewater related methods have the potential to provide a means of reducing nitrogen (to varying degrees). However, due to their variability in performance and variability in the nitrogen concentrations they would address, their performance on a watershed basis is currently difficult to quantify for consistent, widespread performance to achieve a TMDL. Demonstration projects in neighboring Falmouth, the County 208 Planning efforts, and MassDEP guidance will be critical in identifying how nitrogen reduction would be credited. It is important to state that a number of these nitrogen reduction measures will vary in their nitrogen removal performance because of their reliance on natural systems and highly variable loadings. Many are not currently credited with nitrogen removal by regulatory agencies. Additional public education, management structure, and enforcement would be required in order for them to be considered a reliable, long-term means of nitrogen removal. However, they are all considered potential parts of any adaptive management plan.

## **ES.4 Draft Alternatives Scenarios Analysis and Site Evaluations**

### **ES.4.1 Alternatives Development**

As part of the identification of scenarios/options that have been evaluated to date, the report summarizes the various potential effluent (treated water) recharge sites that would be used in conjunction with these alternative scenarios/options and evaluates their suitability. Chapter 3 identifies a number of sites located within the Project Planning Area that were considered as possible recharge sites throughout the duration of the project.

#### **ES.4.1.1 Sites**

The process of identifying sites began in 2003 and was revisited in 2007, 2010, and again in 2012.

Figure ES-2 shows the sites being considered for the development of the Recommended Plan.

Based on these evaluations, the following Table ES-1 summarizes the results:



**Table ES-1 Sites Under Consideration**

| Site Name               | Treatment Site | Recharge Site |
|-------------------------|----------------|---------------|
| Site 2—Ashumet Road     | X              |               |
| Site 4—Transfer Station | X              | X             |
| Site 6—Keeter Property  | X              | X             |
| Back Road Sites         | X              | X             |
| New Seabury/Site 7      |                | X             |
| Willowbend Golf Course  |                | X             |

Note: Site 2—although being kept as a viable location—will likely be combined with a facility at Site 4. Similarly, the Back Road Site may be considered as a cluster facility, but if combined would likely be served from a new facility potentially located at the High School.

Upgrade and expansion of the following facilities/locations is to be considered in the Recommended Plan:

- New Seabury
- Willowbend
- Mashpee High School
- Mashpee Commons

Upgrade and expansion may include physical plant improvements, upgrades to systems handling the currently permitted design flows, upgrades required to handle additional wastewater flows, or complete replacement of the existing facility with a new facility (due to age of system, year of implementation, level of treatment).

The remaining existing WWTFs will remain in use although some may ultimately be converted to pumping stations to transfer the flow to one of the larger proposed/existing facilities.

**ES.4.1.2 Massachusetts Military Reservation (MMR) Site**

The potential use of the MMR site will remain in consideration as part of the Recommended Plan; however, because a local or regional plan has yet to be developed or agreed upon with the MMR, the details of its use may need to be addressed as part of the adaptive management approach the Town takes into consideration with its neighbors Falmouth and Sandwich. The Town’s Board of Selectmen has written a letter dated March 27, 2013 stating the Town’s interest in the use of facilities at this site.

**ES.4.1.3 Rock Landing**

Rock Landing was removed from further consideration for several reasons:

- Difficulty and cost associated with the relocation of the existing wells.
- The site is a very high-quality drinking water supply site that supplies nearly 50 percent of the Town’s water supply.



- Recharge from the location (if wells were relocated and site was used for treated water recharge) would still end up back in several of the Towns' sensitive embayment's and not directly out to Nantucket Sound (for example Site 7).

#### **ES.4.1.4 Potential Cluster System Sites**

Cluster development potential was screened based on proximity to these areas. Based on the summary shown in Table 6-1, the following areas will be carried forward in the Recommended Plan development for further evaluation:

- Briarwood/Otis Trailer Village
- Pickerel Cove
- Pirates Cove
- Tri-Town Circle
- Santuit Pond

Areas within identified natural habitats will need to be addresses on a site-by-site basis. Mitigation and land swap will be considered if these areas remain as part of any Recommended Plan. These efforts will need to be coordinated with Natural Heritage and Endangered Species Program (NHESP) and will likely require additional study that is currently beyond the scope of this project.

#### **ES.4.2 Alternative Scenarios**

Following the release of the Needs Assessment Report, the Mashpee Sewer Commission identified five different management scenarios for evaluation and analysis. This chapter identifies the general characteristics of each scenario and discusses the basic methodology for evaluating each scenario.

The five scenarios are:

- Scenario 1—No expansion of existing wastewater treatment facilities.
- Scenario 2—Upgrade and expansion of existing facilities to a practical extent.
- Scenario 3/3R—Cluster Scenario (prepared by LAI).
- Scenario 4—Fair Share.
- Scenario 5—Centralized approach.

Each of these scenarios were run through the MEP model for both Popponeset Bay and Waquoit Bay East. The following table summarizes the findings as presented in Tables 3 and 4 from the MEP technical memorandum.



**Table ES-2 Summary of Threshold Comparison Results<sup>1</sup> by Scenario**

| Watershed/Embayment Section   | TMDL/MEP Threshold | Scenario     |              |              |                   |              |              |
|-------------------------------|--------------------|--------------|--------------|--------------|-------------------|--------------|--------------|
|                               |                    | 1            | 2            | 3            | 3R <sup>(2)</sup> | 4            | 5            |
| mg/L                          |                    |              |              |              |                   |              |              |
| Popponeset Bay—Head           | 0.38               | <b>0.394</b> | <b>0.386</b> | 0.372        |                   | 0.378        | <b>0.389</b> |
| Mashpee River—Mid to Low      | 0.4-0.5            | <b>0.601</b> | <b>0.570</b> | 0.472        |                   | <b>0.529</b> | <b>0.596</b> |
| Shoestring Bay—Upper to Lower | 0.4-0.5            | 0.472        | 0.462        | 0.461        |                   | 0.449        | 0.461        |
| Ockway Bay—Upper              | 0.4-0.5            | 0.457        | 0.449        | 0.421        |                   | 0.438        | 0.453        |
| Jehu Pond                     | 0.446              | 0.429        | 0.435        | <b>0.472</b> | 0.429             | 0.437        | 0.434        |
| Hamblin Pond                  | 0.380              | 0.252        | 0.253        | <b>0.400</b> | 0.251             | 0.260        | 0.252        |
| Quashnet River                | 0.520              | <b>0.536</b> | <b>0.547</b> | <b>0.585</b> | 0.460             | <b>0.523</b> | <b>0.559</b> |

Notes:

- (1) Data from Tables 5 and 6 from December 15, 2009 MEP Technical Memorandum, except for data regarding Scenario 3R (see Note 2).
- (2) Revised Scenario 3 (3R) as identified in Table 3 of the February 2010 MEP technical memorandum. This scenario did not include rerunning the model for Popponeset Bay. In summary, flow was moved from Waquoit Bay East watershed to the area identified as “Rock Landing/outside” watershed. Flow changes were also made within the following areas/subwatersheds: Moody Pond, Outside watershed, Ashumet Pond, Mashpee-Wakeby Pond, Quashnet River, Peter’s Pond, Santuit River, and Red Brook watersheds, per the report.
- (3) Blue shading represents those that do not meet the Threshold.

**ES.5 2012 Development of Options 1A, 1B, and 1C**

As the Town moved forward in development of a Recommended Plan for nitrogen management within the PPA, three “options” were developed in 2012. These options were developed to meet the TMDL goals. Each option was modeled by the MEP to demonstrate feasibility to meet the TMDLs and was structured based on the previous efforts in 2008. The following tables (ES-3, ES-4, and ES-5) summarize these options:



**Table ES-3 Option 1A—Summary of Recharges**

| <b>Planning Area</b>                            | <b>Locations</b>   | <b>Est. Average Annual Future Flow (gpd, rounded)</b> |
|---|--|---|
| WWTF recharge within Popponeset Bay Watershed   | South Cape Village; Site 4 (Transfer Station); Willowbend; Windchime Point; Stratford Ponds; Cotuit Meadows; Wampanoag Village | 280,000   |
| WWTF recharge within Waquoit Bay East Watershed | Back Road  | 370,000   |
| Septic / I/A recharge in planning area          | Various  | 500,000   |
| Recharge outside watershed                      | Rock Landing; New Seabury; Sandwich; Barnstable; Falmouth  | 1,550,000   |
| <b>Totals (rounded)</b>                         |  | <b>2,700,000</b>                                      |

**Table ES-4 Option 1B—Summary of Recharges**

| <b>Planning Area</b>                            | <b>Locations</b>  | <b>Est. Average Annual Future Flow (gpd, rounded)</b> |
|---|---|---|
| WWTF recharge within Popponeset Bay Watershed   | Site 6 (Keeter); South Cape Village; Site 4 (Transfer Station); Willowbend and golf course; Windchime Point; Stratford Ponds; Cotuit Meadows; Wampanoag Village; Pirates Cove; Santuit Pond Cluster, Sandwich | 1,520,000   |
| WWTF recharge within Waquoit Bay East Watershed | Back Road; Site 6 (Keeter)  | 480,000   |
| Septic / I/A recharge in planning area          | Various   | 340,000   |
| Recharge outside watershed                      | Site 6 (Keeter); New Seabury; Barnstable; Falmouth  | 350,000   |
| <b>Totals (rounded)</b>                         |   | <b>2,700,000</b>                                      |



**Table ES-5 Option 1C—Summary of Recharges**

| <b>Planning Area</b>                            | <b>Locations</b>   | <b>Est. Average Annual Future Flow (gpd, rounded)</b> |
|---|--|---|
| WWTF recharge within Popponesset Bay Watershed  | Site 6 (Keeter); South Cape Village; Site 4 (Transfer Station); Willowbend and golf course; Windchime Point; Stratford Ponds; Cotuit Meadows; Wampanoag Village; Pirates Cove; Santuit Pond Cluster, | 1,030,000   |
| WWTF recharge within Waquoit Bay East Watershed | Back Road; Site 6 (Keeter)   | 480,000   |
| Septic / I/A recharge in planning area          | Various  | 500,000   |
| Recharge outside watershed                      | Site 6 (Keeter); New Seabury; Barnstable; Sandwich; Falmouth   | 690,000   |
| <b>Totals (rounded)</b>                         |  | <b>2,700,000</b>                                      |

**ES.5.1 MEP Model Results**

In November 2012, the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) issued the model results for the three Options (1A, 1B, and 1C). The results indicated that “all three options meet the threshold values/TMDLs at the sentinel station for restoration of eelgrass in Popponesset Bay.” The results also indicated that “all three options do not meet the threshold values at the sentinel station for restoration of eelgrass in Jehu Pond or Hamblin Pond. All three options do meet the water column TN concentration that would be restorative of infaunal habitat in the Quashnet River”. Their model result tables also indicate that all three options meet the TMDL/MEP threshold for Great/Little River and Upper Waquoit Bay.

Based on their model analysis in this watershed, Options 1A and 1B removed more nitrogen than necessary indicating that these options could potentially be adjusted to reduce the amount of sewerage or accept additional flows from the Waquoit Bay watershed to help address the nitrogen load in Jehu Pond and/or Hamblin Pond.

The following table summarizes the findings as presented in Tables 3 and 4 from the MEP technical memorandum.



**Table ES-6 Summary of Threshold Comparison Results by Option**

| Watershed/Embayment Section   | TMDL/MEP Threshold | Option 1A    | Option 1B    | Option 1C    |
|-------------------------------|--------------------|--------------|--------------|--------------|
|                               | mg/L               | mg/L         | mg/L         | mg/L         |
| Popponeset Bay—Head           | 0.38               | 0.359        | 0.366        | <b>0.381</b> |
| Mashpee River—Mid to lower    | 0.4-0.5            | 0.447        | 0.474        | 0.492        |
| Shoestring Bay—Upper to lower | 0.4-0.5            | 0.433        | 0.440        | 0.481        |
| Ockway Bay—Upper              | 0.4-0.5            | 0.413        | 0.436        | 0.451        |
| Jehu Pond—WB1                 | 0.446              | <b>0.471</b> | <b>0.481</b> | <b>0.481</b> |
| Great/Little River—WB3        | 0.38               | 0.355        | 0.359        | 0.359        |
| Hamblin Pond—WB4              | 0.38               | <b>0.39</b>  | <b>0.398</b> | <b>0.398</b> |
| Quashnet River—WB7, WB8       | 0.52               | 0.502        | 0.503        | 0.503        |
| Upper Waquoit Bay—WB12        | 0.38               | 0.358        | 0.359        | 0.359        |

Blue shading represents those that do not meet the Threshold.

Discussions with MEP indicate that although Jehu and Hamblin Ponds do not meet the TMDL thresholds, this is a reflection of the new model including all of Waquoit Bay, not just the portions evaluated previously. This also reflects no nitrogen removal in other parts of Waquoit Bay. If additional nitrogen removal occurs in Falmouth within the Waquoit Bay watershed west of the PPA, it is very likely that these two subwatersheds will meet the TMDLs.

## ES.6 Cost Evaluation, and Operations and Maintenance Considerations

### ES.6.1 Introduction

Cost evaluations as part of this project—and ultimately its implementation—are being performed in multiple steps. The initial step, started in 2008, was used to compare the various alternatives being considered on a macro scale across the entire watershed areas including adjacent communities. The purpose of developing costs at this scale was to consider alternatives on a side-by-side analysis and attempt to provide the large (whole) picture perspective.

As part of this report, costs were then developed for Options 1A, 1B, and 1C to establish a baseline to work from as the plan is refined. These costs will ultimately be included in the development of the Recommended Plan and reported in the Draft Recommended Plan/Draft Environmental Impact Report (DEIR) document as stated previously as a baseline comparison as alternative measures are considered (i.e. regionalization/MMR facility use, shellfish aquaculture, etc.). The estimated project costs for the Recommended Plan will be established as part of the cost-effectiveness analysis. This analysis in the subsequent report will identify and compare cost-effective alternatives (shellfish aquaculture, PRBs, cluster systems, regional solutions, and ownership/operational issues etc.) to more traditional methods in certain areas for the Town to consider as part of implementation. These costs would then be further refined as part of the Final Recommended Plan/Final EIR, and ultimately as part of any design phase and implementation.

Because each alternative is dependent on achieving the TMDL, the key factor is how much nitrogen can be recharged within a watershed at a particular location. Each of the alternatives presented to date include



some component of reuse of existing septic systems, reuse of existing WWTFs, upgrade of existing WWTF, construction of new WWTFs, and regional solutions, all of which are based on a future build-out condition.

Phasing will be defined in the Draft and Final Recommended Plan Reports.

It is important to identify that costs for implementation of any Recommended Plan will be incurred over an extended time period based on the magnitude of the problem and the economic impacts associated with such a solution. Project phasing and actual future growth will also impact costs. Therefore, the use of adaptive management to monitor cost and performance will be discussed in more depth as part of the Recommended Plan. The monitoring of the embayment systems, implementation of growth controls through land use and zoning, and implementation of best management practices for control of run-off and other non-wastewater nitrogen contributions will all aid in the management of wastewater and may provide for a reduction in sewerage. As towns are forced to achieve higher levels of treatment to achieve nitrogen removal, phosphorus removal, or other wastewater constituents, the costs will likely increase to provide these higher levels of treatment.

### **ES.6.2 Operation, Maintenance, and Monitoring of Plan Components**

Operation, maintenance, ownership, and monitoring of the components of any plan will also have a significant impact on the system costs. Whether a Town or District owns/operates/maintains each of their system components (pumps, stations, treatment facilities, etc.) or relies on contract operations, private ownership, etc., these all have an impact on costs. The following section discusses some of the options the Town/District will have to consider regarding the management and operation of these systems.

### **ES.6.3 Options for Ownership and Management of Facilities**

There are several options that can be considered in ownership and management of any facilities integrated into the Recommended Plan. Several documents have been developed on the regional, state, and federal level discussing management options that Mashpee will need to consider as Mashpee develops its approach to own and operate these facilities.

#### **ES.6.3.1 Federal Guidance**

USEPA published the “Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems” in March 2003. This document presents five different management models that could be employed by a town or regional management entity. These could relate to several issues including:

- Grinder/STEP pumping systems.
- Package/Cluster treatment facilities
- Onsite septic/denitrifying (I/A)/eco-toilet type systems.

#### **ES.6.3.2 State Guidance**

MassDEP also prepared a guidance document as part of the Massachusetts Estuaries Project. This document entitled “Embayment Restoration and Guidance for Implementation Strategies” was published in 2003, and discusses several approaches to nitrogen reduction including the formation of management districts. Mashpee has already started this process related to the formation of a Water and Sewer District;



however until the legislation regarding that District is completed it is unclear how individual systems and existing systems will fit into this new structure. Their inclusion in this new District is currently being considered.

This state guidance document summarizes the advantages of a “District Approach” in dealing with nitrogen reduction, including the flexibility and funding advantages this type of approach to management could provide.

### **ES.6.3.3 Regional Guidance**

The Cape Cod Commission (CCC) also developed a “Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project” report published in June 2003. This document also discussed Wastewater Management Districts.

The formation of a district or town department to manage these types of systems will need to be considered as part of any alternative plan.

## **ES.7 Framework**

### **ES.7.1 Introduction**

The Project team worked through a worksheet prepared by the Sewer Commission to consider which items/plan components should be carried forward, and based on that list Options 1A, 1B, and 1C were examined to see how these components could be integrated into those nitrogen management options. Major components were identified so that a cost evaluation of various alternatives could be compared as part of the Recommended Plan Report.

Based on the various components to be considered, each was grouped into one of the following three categories (each as defined below):

- Source Removal
- Direct Environmental Mitigation
- Land Management Strategies

### **ES.7.2 Source Removal**

Source removal is the removal of nitrogen (or some portion of it) before it reaches the local groundwater, and can be further divided into the following subcategories:

- Wastewater Management
- Stormwater Management
- Fertilizer Management

Each of these allows the towns within the planning area to mitigate nitrogen before it enters the groundwater and eventually makes it to the ponds and estuary systems.

Several approaches were identified:

- Cluster Systems at the following locations:
  - Santuit Pond area



- Pirates Cove
- Monomoscoy / Seconsett / Popponeset Island
- Other areas
- Use of Existing WWTPs (in the planning area)
  - Use of all; however ownership, upgrade, and expansion will be site-dependent and discussed later in the cost section
- New WWTPs
  - Transfer Station and High School
  - Possibly at Keeter, Old Highwood Well
  - Unlikely at Rock Landing or Back Road sites
- Eco-Toilets
  - Mashpee needs to establish what its plan will be to address these, may follow Falmouth’s lead
- MMR
  - Unknown at this time whether the site will be available for any use. Ideal for regional facility, especially if expanded recharge is allowable at the existing sand infiltration beds.
- Stormwater
  - BMPs need to be implemented on a case-by-case basis, with nutrient removal capabilities considered in most sensitive watersheds

### **ES.7.3 Direct Environmental Mitigation**

Direct environmental mitigation is essentially removal of nitrogen (or some portion of it) at or in close proximity to the area of impact. This can be further divided into the following subcategories:

- Dredging/Inlet Widening
  - No clear areas identified in either MEP reports for dredging or widening to significantly improve water quality. For Popponeset Bay the MEP report stated “it is unlikely that dredging will improve water quality with the three main subembayments”, however the report stated that the main channel should continue to be dredged to avoid further degradation of estuaries health. Same as for removal of “muck” removal from the bottom any of the Town’s estuaries (outside of regular maintenance for navigation).
- Shellfish Aquaculture
  - Oysters—Mashpee River, Popponeset Bay
  - Quahogs—Jehu, Hamblin, Great River, Little River, Ockway Bay, and Popponeset Bay
- Permeable Reactive Barriers (PRBs)
  - Pirates Cove
  - No other definitive areas identified at this time



- Enhanced Natural Systems
  - Abandoned Cranberry Bog naturalization/conversion
    - Discussion on bogs south of Santuit Pond and those east of the Quashnet River
    - Potential conversion of shallow ponds/water hazards to deeper ponds for additional natural attenuation

#### **ES.7.4 Land Management Strategies**

Land management strategies are essentially growth and development management strategies to reduce the potential of the PPA reaching a build-out condition which increases the cost and difficulty of achieving TMDL compliance.

Much of the discussion as part of this project to date has focused on the Source Removal approach, and recently there has been a greater push for the Direct Environmental Mitigation to be used in one of two ways—reduce or eliminate the need for Source Removal in certain areas, or be implemented prior to Source Removal—to either allow longer phasing of any Source Removal strategy or ultimately the reduction of the need for full-scale traditional wastewater management.

As was clearly shown in all eight previous scenarios, a massive amount of Source Removal is required to achieve the TMDLs under the build-out condition if Direct Environmental Mitigation is not considered or feasible.

- Growth Neutral/Flow Neutral
  - Town will need to develop a policy that meets the criteria of the State SRF program to make themselves eligible for zero-percent SRF loans
- Purchase of Open Space/Build-out Development Properties
  - Town will need to identify which properties could be purchased to reduce build-out potential, therefore reducing potential future flow and reducing the projected nitrogen loading to the embayments
- Potential Well and/or Treatment and Disposal Sites
  - Town can work towards securing additional public drinking water supply well locations and potential treated water recharge sites to foster flexibility in addressing their wastewater needs and protecting their drinking water supplies
- Seasonal and year-round property phasing impacts
  - Phasing and implementation can target year-round developments or apply near-term solutions to areas that are more seasonal in nature to achieve a quicker rate of result while minimizing infrastructure investment in the near-term

### **ES.8 Draft Recommended Plan and Draft Environmental Impact Report Outline**

The following outline was developed for the Draft Recommended Plan Draft Environmental Impact Report. It is detailed in Chapter 7.

Chapter 1 Introduction



|            |   |
|------------|---|
| Chapter 2  | Summary of Previous Documents Prepared as Part of Mashpee's Watershed Nitrogen Management Plan (WNMP) |
| Chapter 3  | Public Participation and Outreach   |
| Chapter 4  | Recommended Plan Framework (from ASAR)  |
| Chapter 5  | Evaluation of Recommended Plan Variables  |
| Chapter 6  | Environmental Impact Report   |
| Chapter 7  | Recommended Plan  |
| Chapter 8  | Draft Section 61 Findings   |
| Chapter 9  | Phasing and Implementation  |
| Chapter 10 | Adaptive Management Plan Framework  |
| Chapter 11 | Next Steps  |

## **ES.9 Summary**

The Alternative Screening Analysis report sets the framework for the Recommended Plan; and in the draft Recommended Plan report additional evaluation of alternative methods, costing, and phasing will be established in addition to the framework for the adaptive management plan.

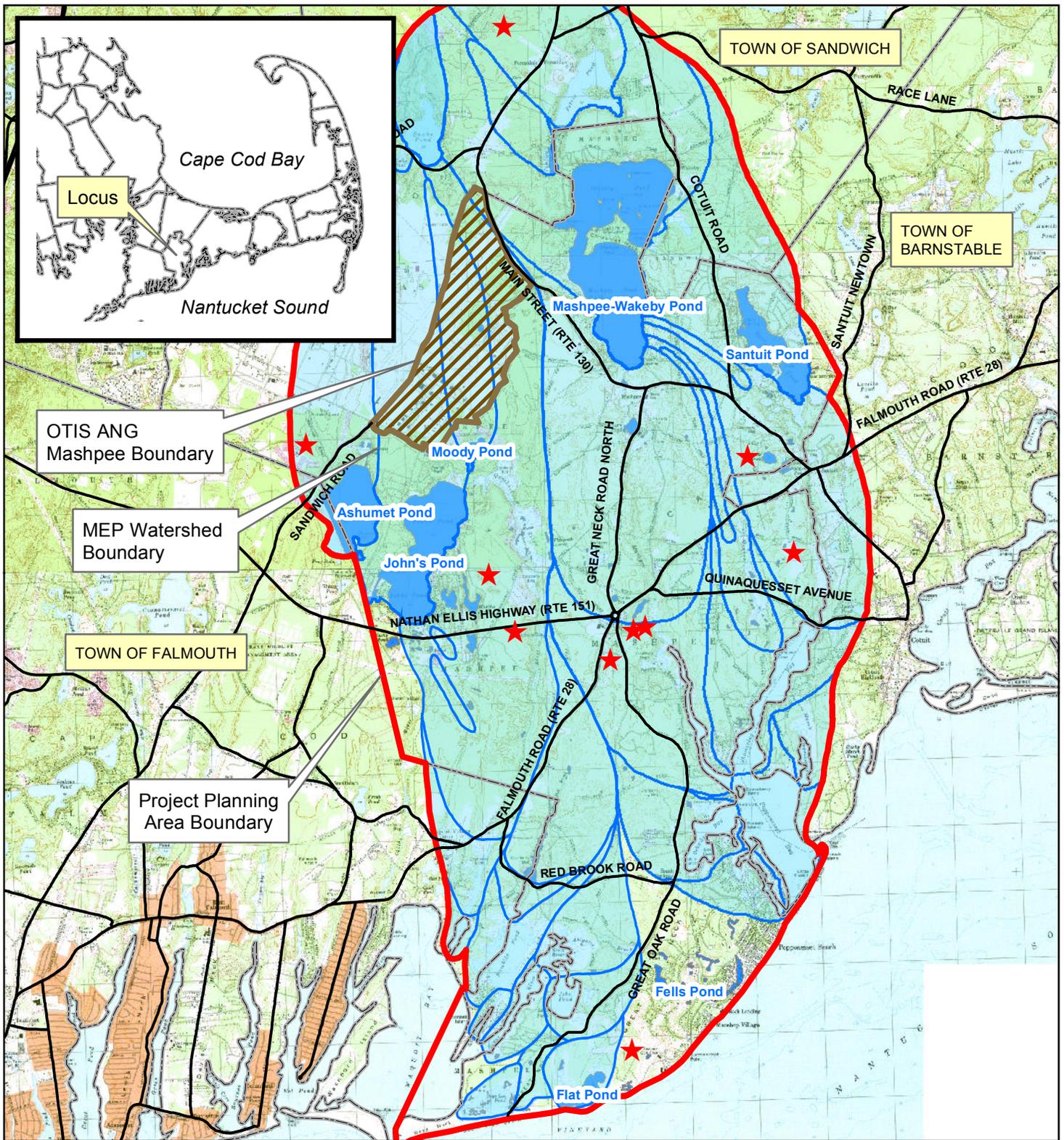
There remain several important factors that still need to be addressed either as part of the plan or identified as additional efforts as part of that plan to be completed as the Town looks to phase in their mitigation measures to work toward achieving the TMDLs with their neighboring communities of Barnstable, Falmouth, and Sandwich. Some of those items are outlined below:

Key components and next steps in developing the Recommended Plan:

- Cape Cod Commission and MassDEP direction on the enforcement and permitting issues associated with the TMDLs, such that each Town within the PPA will have a clear understanding of their regulatory obligation, and therefore will be able to create the necessary structure to monitor, manage, and enforce TMDL compliance, whether that be through a Board of Health, Sewer Commission, Department of Public Works, Sewer Department, Sewer District, or other structure.
- Development of an Adaptive Management Plan and Long-term TMDL Monitoring (fresh and salt water). The groundwater travel patterns and times, and estuary flushing conditions are influenced by a number of factors; an appropriate plan will need to be developed by the towns and regulatory agencies to monitor the effectiveness of the plan in meeting the TMDLs.
- Development of a flexible management approach that allows change based on the permitting and monitoring requirements identified above. As part of the WNMP, it is anticipated that a cost-effective approach to water quality improvement in the estuaries will be established, setting the framework of fiscally achievable goals with a long-term plan (likely greater than 20 years) to work towards TMDL compliance.



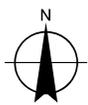
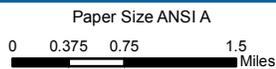
- Need to discuss ownership of collection systems, management options, development versus build-out impact on costs, including private facilities acquisition/ownership/operations/maintenance
- The plan's funding mechanism including cost of phasing and bonding in increments
- Additional effluent disposal site evaluations (including those outside of the watersheds) and securing of facility, cluster, and PRB sites, and pumping station locations
- Development of sewer regulations and sewer rate structure
- Phosphorus removal considerations (upgradient of fresh water systems)
- Consideration of Town regulation on fertilizer use/application



LEGEND

★ WWTF Location

\*The Project Area is the combination of the Town of Mashpee area and the watersheds of Popponesset Bay and Waquoit Bay-East as delineated by the Massachusetts Estuaries Project (MEP)



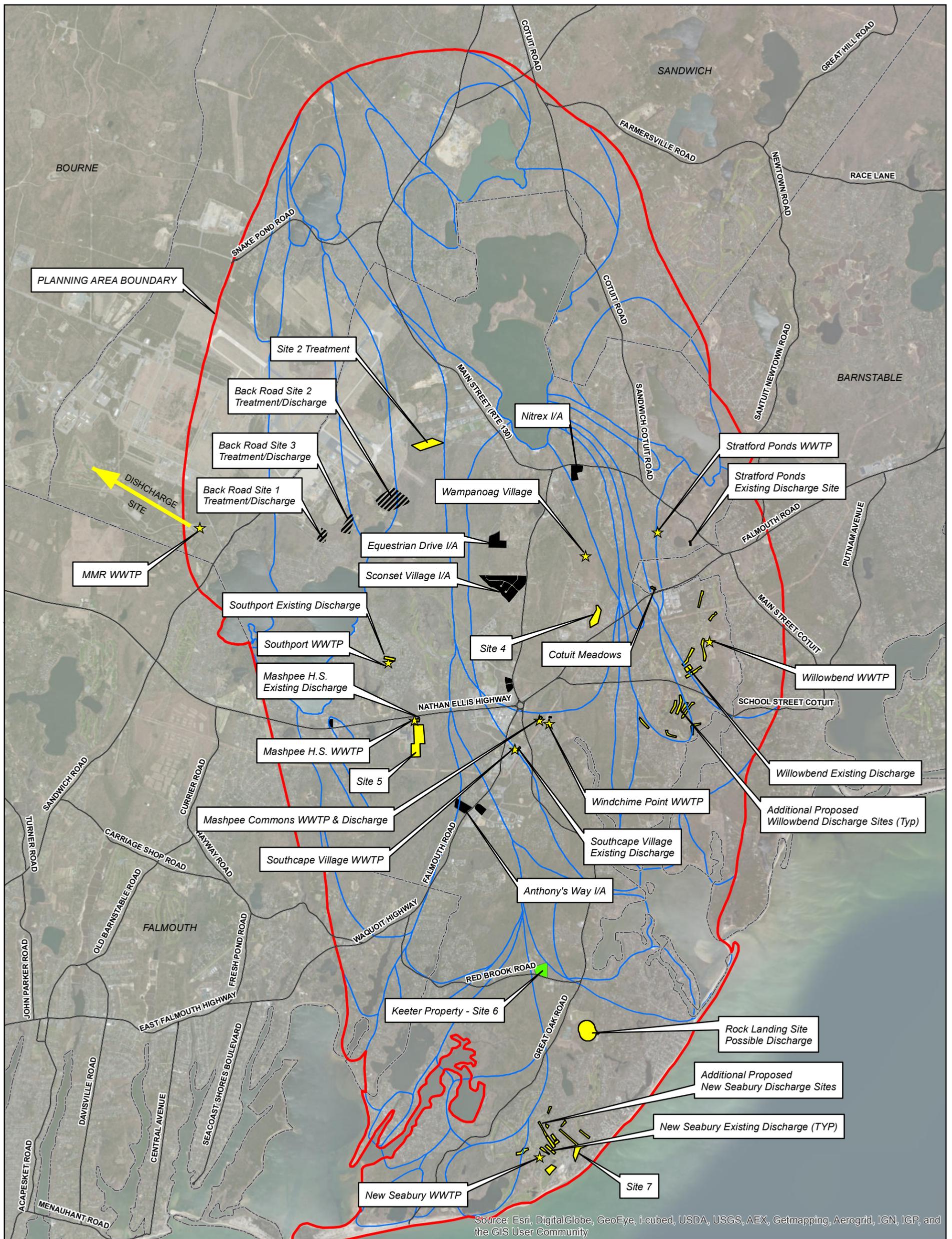
Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001

Town of Mashpee Sewer Commission  
Watershed Nitrogen Management Plan

Job Number | 86-12001  
Revision | A  
Date | 07 Aug 2013

LOCUS MAP

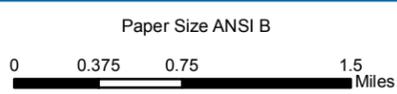
Figure ES-1



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

LEGEND

- ★ MMR\_Site
- ▨ Proposed Treatment/Discharge Site
- ★ Existing Private WWTP
- ▭ Planning Area Boundary
- ▭ Existing Discharge Site
- ▭ I/A Systems (cluster only)
- ▭ Town Boundaries



Map Projection: Lambert Conformal Conic  
Horizontal Datum: North American 1983  
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

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Wastewater Removal Areas

Figure ES-2